



Accelerator & NuMI Upgrades Update

Paul Derwent

19 February 2013

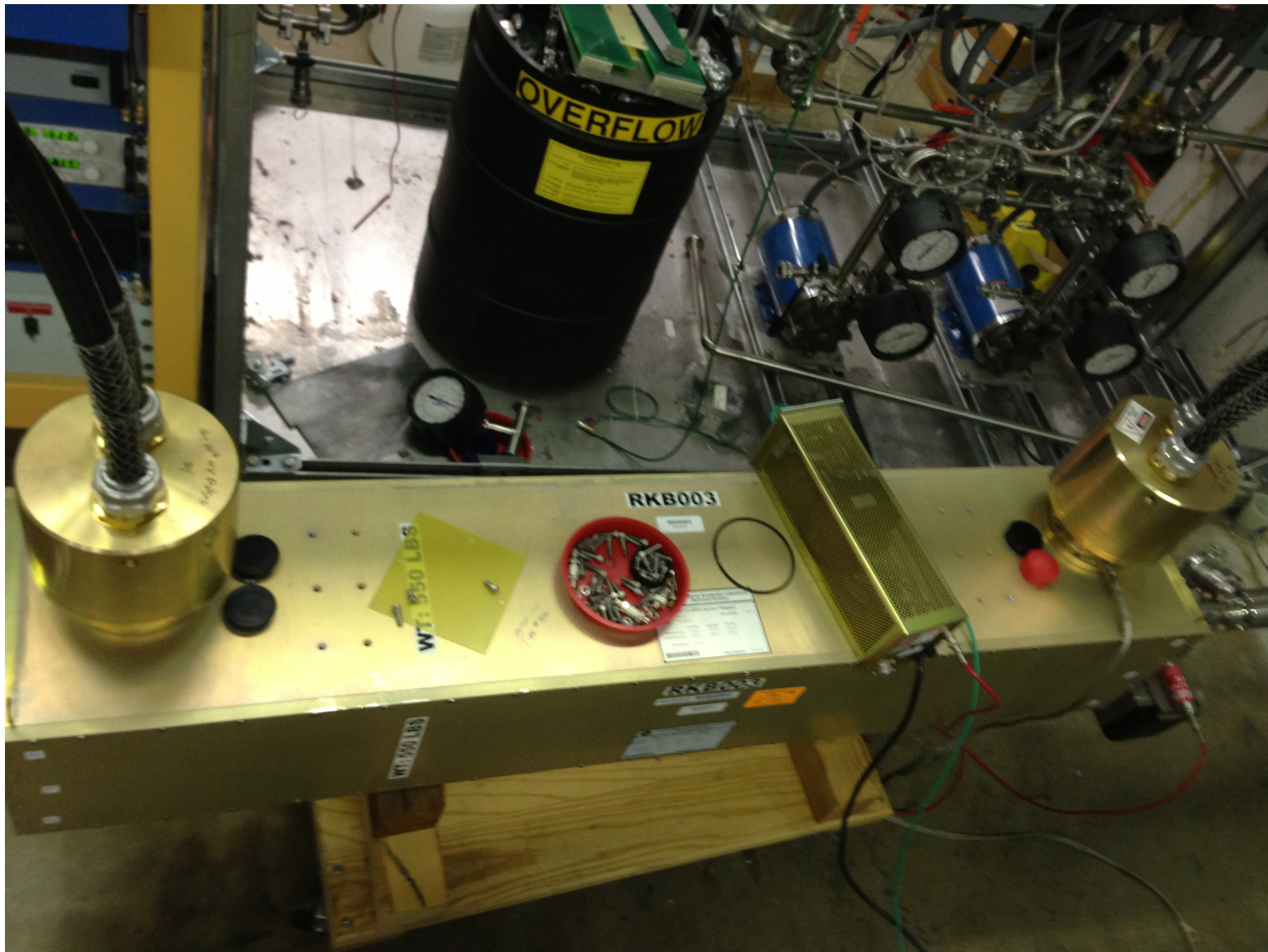


Remaining ANU Critical Path Hardware

- Remaining kickers are in fabrication
 - Long full turn RKB magnets in progress – fabrication complete February
 - Building 6, 4 required for beamline
 - 3 through HV testing, 4 through LV testing
 - Sparking Resistor in life testing (110% of nominal voltage)
 - Tested 25 magnets (100 resistors), 1 failure? 2 day replacement, then through testing again
- RF cavities:
 - First cavity ready for installation
 - 2nd cavity (Rising Son)
 - Into test cave for power tests: Low Voltage complete, High Voltage in progress
 - 3rd cavity (Phoenix) had major vacuum welds in June
 - Vacuum ports complete in December
 - Finishing on operations funds (hot spare)
- Beam Pipe & Vacuum components:
 - Injection line installation moving along
 - “Looking like a beamline”



RKB in test cage





Preparing for RR30 installation

RR-30 straight:

Staging stands and other hardware in the tunnel in preparation for installation

Riggers start work February 18

2 Crews, working from both ends toward the middle



RR-30 straight: At MI-60
beam pipe welding, leak checking, &
alignment

-> minimize radiation exposure

Girders installed on the stands





RF Cavity status



Recycler RF #1 Status

- Ready for installation

2nd Cavity (Rising Son) in Test Cave

Conditioned with 500 W
High Power tests underway

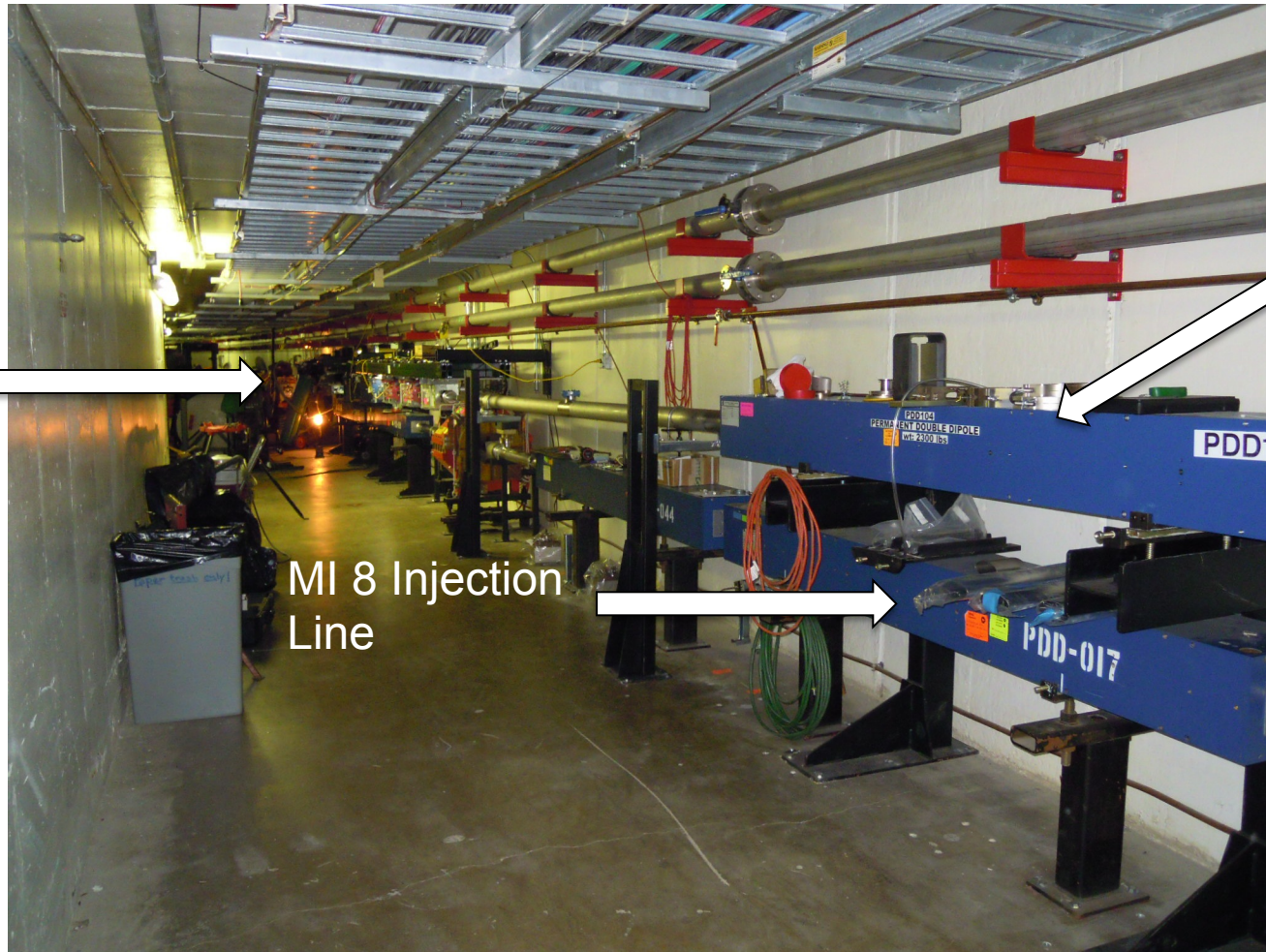
mounted on installation
cradle

Recycler RF #2



Injection line Vacuum installation

- Looking back towards the Booster, vertical switch magnet



Vertical
Switch
Magnet

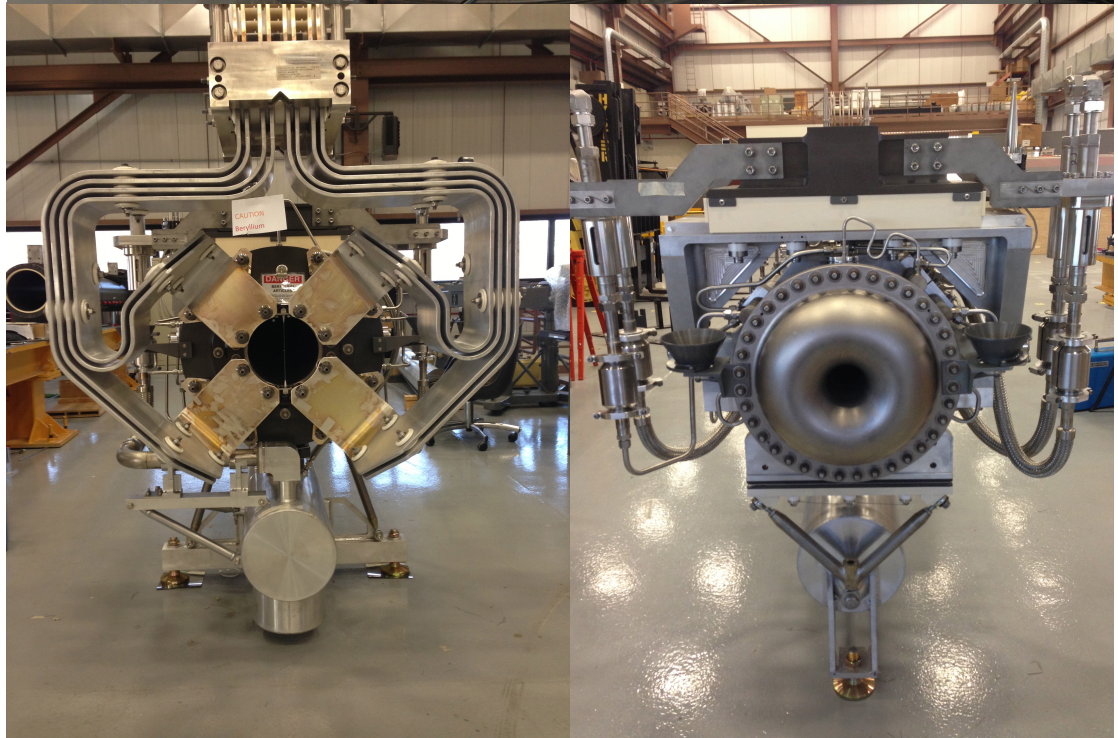
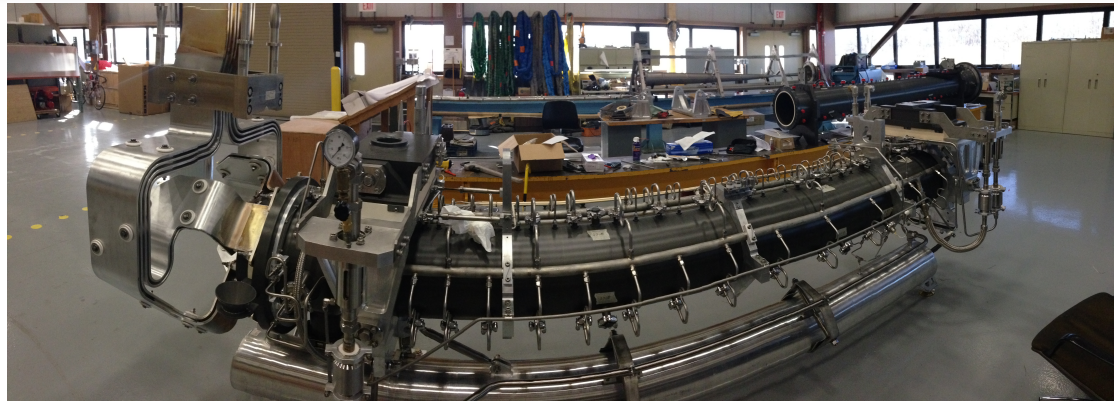
MI 8 Injection
Line

New
Recycler
Injection
Line



Target Hall installation

- Target & Horn 1
 - Horn 1 Installation underway!
 - 11 – 22 February
 - Horn 1 power testing, beam pipe window installation, dehumidification work in March
 - Target installation
 - 1 – 12 April
 - Target hall buttoned up and ready for beam by 26 April

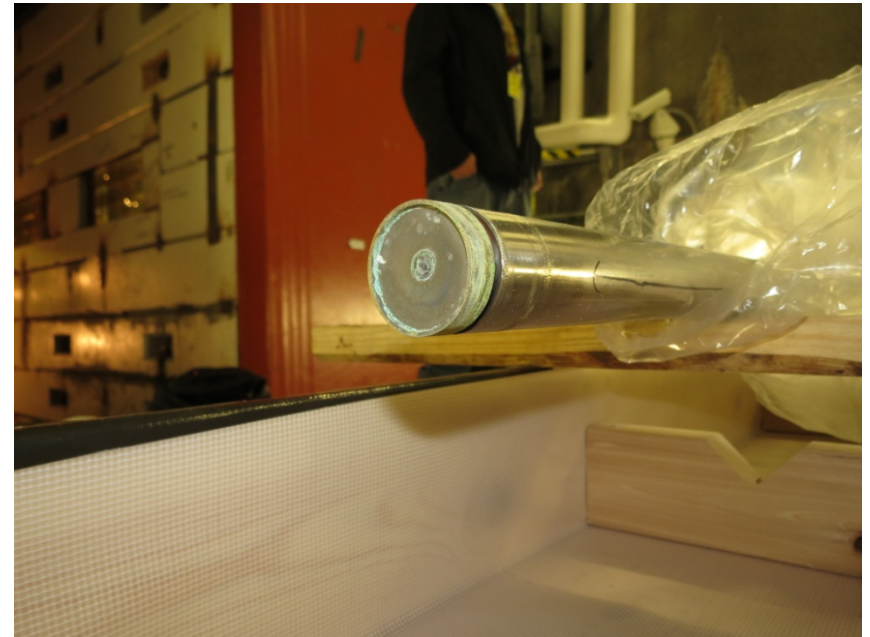
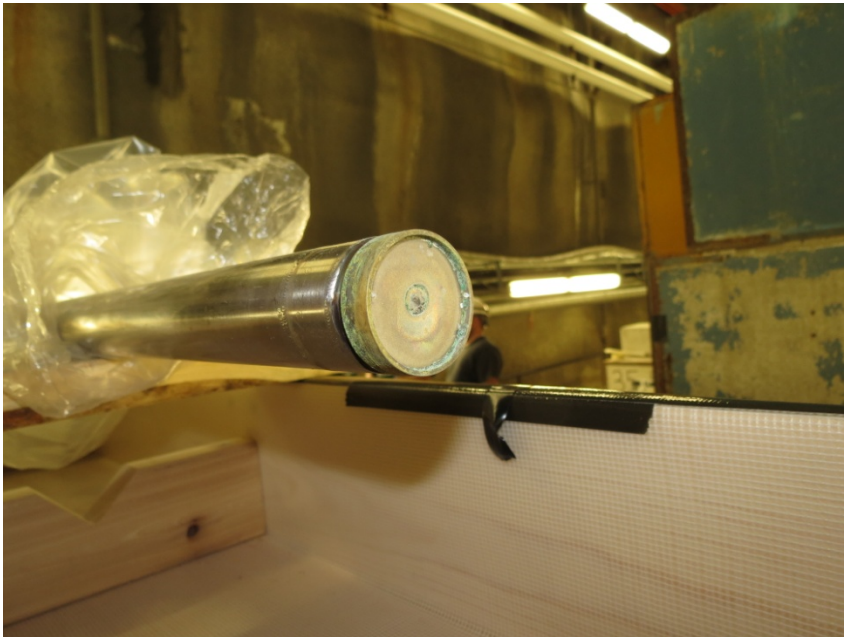




Target Beryllium Window Vacuum Leak

Corrosion and radiation damage?

Leak was on the weld between Be and Steel



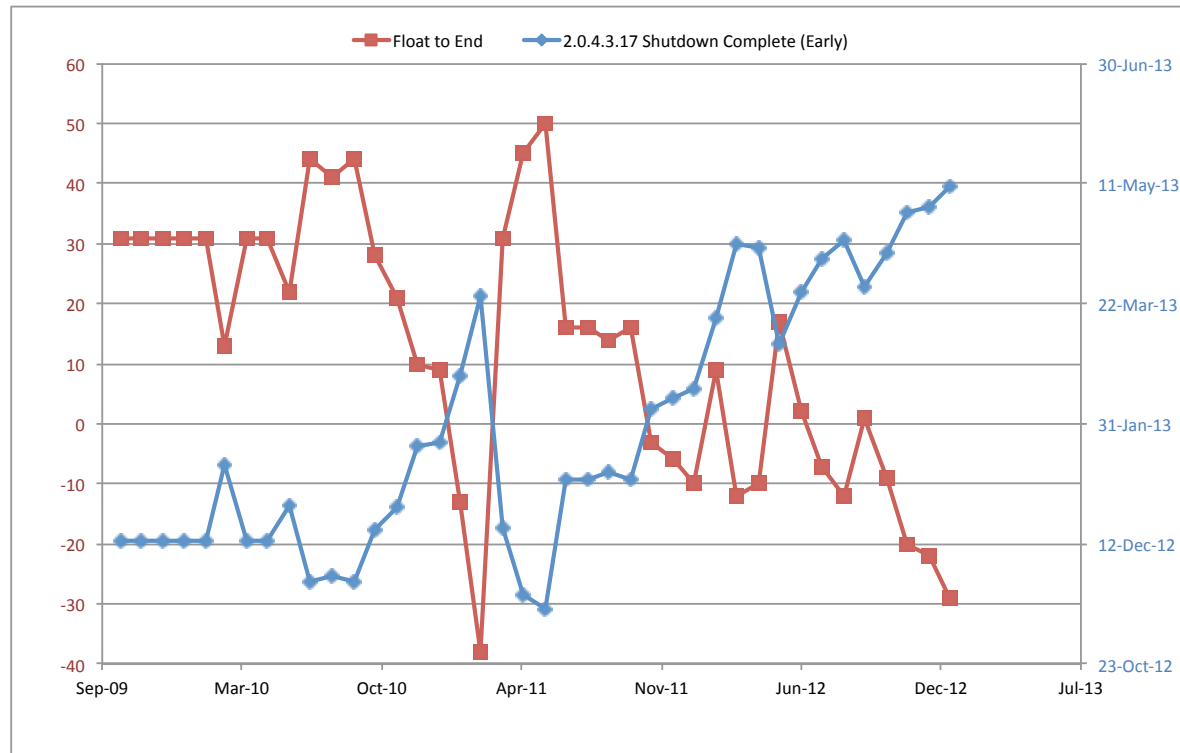
Rework of the spare window/beam pipe piece before reinstallation

Supported by AD maintenance but necessary to complete before beam!



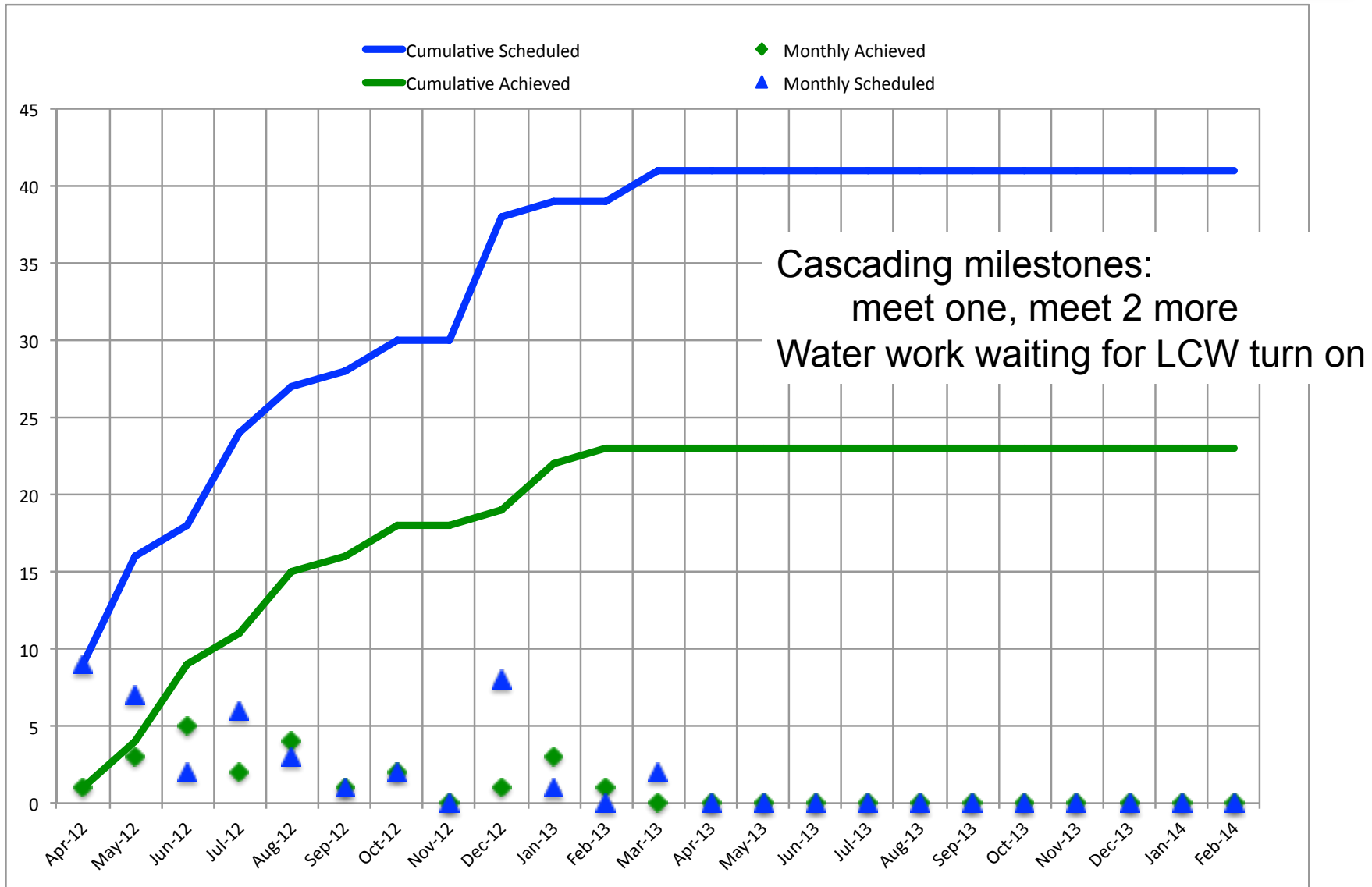
Shutdown float

- OpenPlan end of shutdown: May 10th (January Status)
 - Kicker Power Supply work in Service Building -> underway now
 - RR30 installation -> week of February 18
 - RF Cavity -> Preparation work started last week
 - -29 days of float to April 1, 2013





Remaining milestones





Estimates to Complete

- November 14: started polling the L3/L4s in ANU on remaining budget vs remaining work
 - Showed them the budget and asked if it was enough
 - Results went into the McCluskey ETC assessment in December

NB: week before Lehman review!
- January 3: started another round with L3/L4s
 - Asked a different question: how much effort is required to complete the work?
 - Broke it down into 27 pieces and went to speak with responsible parties
 - Labor in major categories (techs, engineers, drafting, machining, welding, electricians, riggers)
 - Making a comparison between budget and estimate
 - A bottoms up estimate, with top down multipliers from me (in 10 of the 27 sections, 50-100%)
- February 4: another go-round with L3/L4s
 - Updating the January data



Budget – Estimate Result

		Tech Days	Welder Days	Electrician Days (or maybe pipefitters!)	Rigger Days	Engineering Days	
total		358	(213)	(22)	(196)	188	
II Beam Pipe & Vacuum Installation		5	(15)	0	0	0	
MI 60 Staging Crew		24	0	0	0	0	
MI 60 Girder Work		(60)	(7)	0	0	0	
RR 30 Straight Installation		(33)	0	0	(212)	5	
EL Installation		44	0	0	(75)	5	
Multiwire/DCCT/Toroid fabrication		(28)	7	0	0	(2)	
DCCT Installation		25	0	0	0	3	
MI 614 Reconstruction		(8)	0	0	0	0	
RR 40 Vacuum		(33)	(2)	0	0	0	
RR RF Installation		125	(3)	0	39	14	
Damper Installation		32	(2)	12	32	3	
BPM Hardware Installation		(39)	0	0	0	(9)	
Vacuum Hardware & Prep		(107)	(204)	0	0	3	
RR RF cavity 1 Retrofit		(7)	0	0	0	3	
RR RF mid & hi level		(90)	0	0	0	(5)	
RR RF low level		4	0	0	0	6	
RR Water		42	(2)	7	0	6	
NuMI Water		32	0	39	0	2	
Recycler Shims		66	0	0	0	0	
Cable Pulls		0	0	(80)	0	0	
RKB Fabrication		53	13	0	0	36	
Kicker Power Supplies & Testing		203	(8)	0	0	74	
Installation Planning		(14)	9	0	0	(59)	
Target & Horn 1 Installation		73	0	0	0	14	
Target Hall Infrastructure		19	0	0	20	14	
Timing & Controls		(13)	0	0	0	1	
RBEX and Ramped Supplies		56	0	0	0	71	
Ramped Correctors		(13)	0	0	0	3	
Dollars?		\$264,554	(\$231,432)	(\$21,302)	(\$239,281)	\$223,169	(\$4,292)
value of a single day		\$740	\$1,085	\$980	\$1,223	\$1,185	

Balance to
\$4,292!!!
1 rigging
crew day



January EVMS Performance

- ACWP (\$961,143) BCWP (\$79K my guess)
- 3rd RF Cavity work: moved off project, assigned to AD Equipment
 - (\$1.43M) in ACWP, (\$602K) to BCWS and BCWP
- ACWP \$477,620, BCWP \$681k my guess
 - Positive CV for ANU
 - Pump Vault 9 work: assigned to AD operating
 - (\$51K) in ACWP with no changes to BCWS or BCWP (moved off project in CR586 Nov 2012)



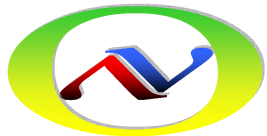
Summary

- Shutdown work progressing
 - RR30 work underway in February
 - Horn 1 installation in February
 - Target in April – after beam pipe work in March
- No longer on schedule for 1 April 2013 completion
 - May 1 is current estimate
- Doing regular ETC
 - February estimate: minimal CV in next 3 months
 - looking for ways to recover costs



Additional information if necessary to discussion

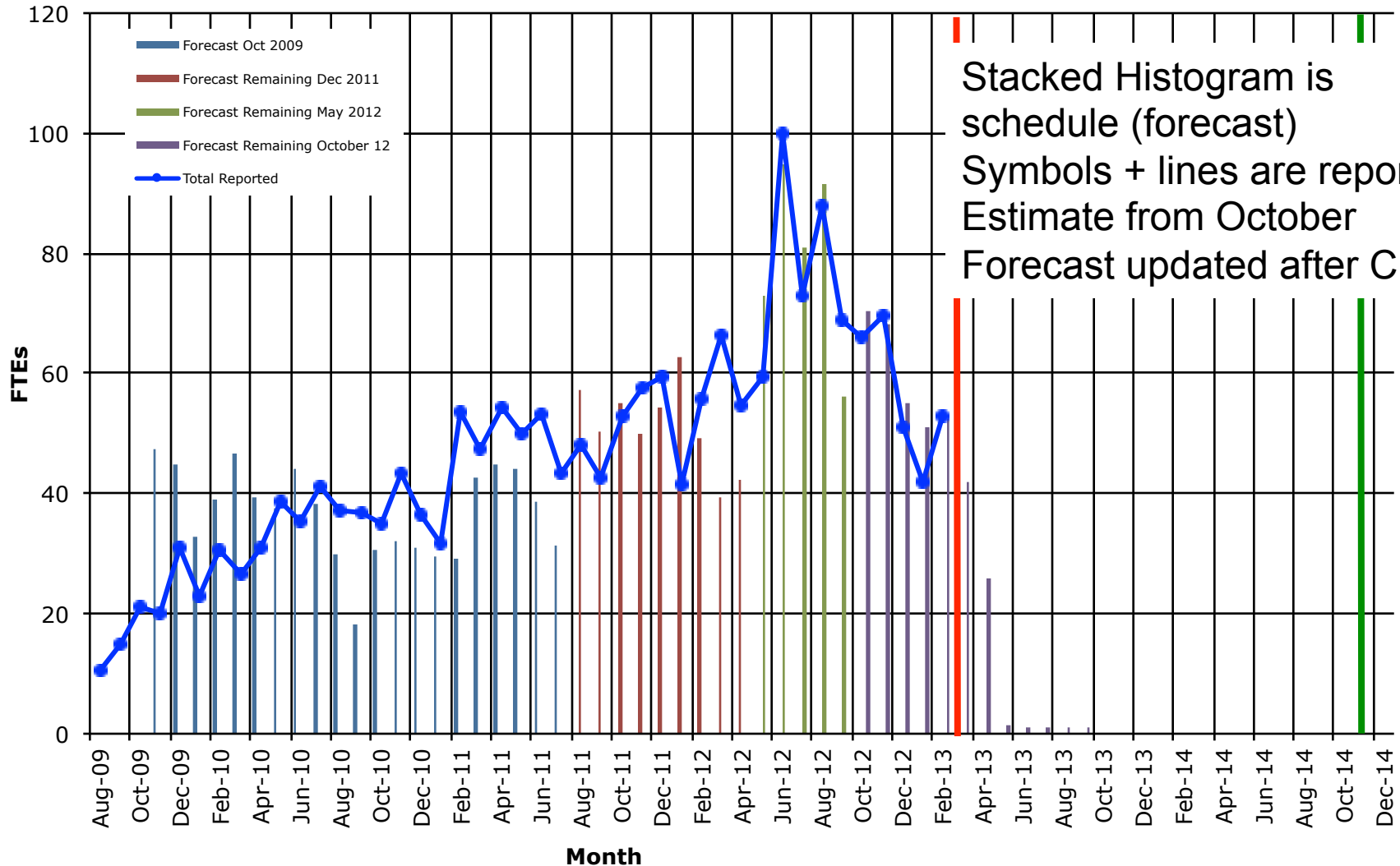
Aka Backups!



ANU Resource Requirements

Time Now

CD-4



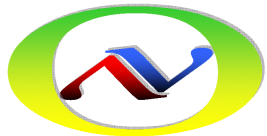
Stacked Histogram is
schedule (forecast)
Symbols + lines are reporting
Estimate from October
Forecast updated after CR573

FTE := 147.3 hours/month



Budget for remaining tasks

through January Status		Tech Days	Welder Days	Electrician Days	Rigger Days	Engineering Days		M&S (loaded \$)	M&S (unloaded \$)
									1.16
total		2319.64375	29.6675	78.25625	299.375	580.335		\$284,751	\$245,474.97
II Beam Pipe & Vacuum Installation		92.5						\$2,923	\$2,519.61
MI 60 Staging Crew		204.375				30			
MI 60 Girder Work		0							
RR 30 Straight Installation		183.125			58.125	5		\$11,833	\$10,200.86
EL Installation		148.75			60	5		\$17,811	\$15,354.31
Multiwire/DCCT/Toroid fabrication		1.5625	7.5			0.75		\$0	
DCCT Installation		63				3.2		\$0	
MI 614 Reconstruction		0						\$0	
RR 40 Vacuum									
RR RF Installation		292.5			129	14.25		\$30,204	\$26,038.22
Damper Installation		92.25		12	32.25	3		\$52,061	\$44,880.17
BPM Hardware Installation		42						\$0	
Vacuum Hardware & Prep		2.64				2.64		\$33,243	\$28,657.67
RR RF cavity 1 Retrofit (includes testi		23.24	0			23.24		\$0	\$0.00
RR RF mid & hi level		0						\$0	
RR RF low level		4.35				41.1		\$0	
RR Water		69.91875		7.41875		15.58125		\$5,423	\$4,675.00
NuMI Water		72.41875		38.8375		17.30625		\$30,003	\$25,864.61
Recycler Shims		146.0625						\$0	
Cable Pulls				20				\$0	
RKB Fabrication		52.67	12.78			36.21125		\$19,211	\$16,561.59
Kicker Power Supplies & Testing		345.5375				186.03125		\$25,671	\$22,130.17
Installation Planning		43.375	9.3875			23.85		\$0	
Target & Horn 1 Installation		172.99375				37.96875		\$27,043	\$23,312.97
Target Hall Infrastructure		94.1			20	15.3		\$5,028	\$4,334.48
Timing & Controls		11.525				16.00625		\$7,341	\$6,328.71
RBEX and Ramped Supplies		136.25				101.4		\$7,468	\$6,438.15
Ramped Correctors		24.5				2.5		\$9,487	\$8,178.45
Dollars?		\$1,715,875	\$32,185	\$76,667	\$366,184	\$687,672	\$2,878,584		
value of a single day		\$740	\$1,085	\$980	\$1,223	\$1,185			



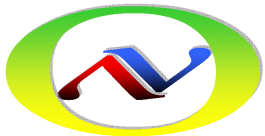
Estimates for remaining tasks

		Tech Days	Welder Days	Electrician Days	Rigger Days	Engineering Days		January comment	scale factor	February Comment
total		1962	243	100	495	392				
II Beam Pipe & Vacuum Installation		88	15							had 24 welder days in my notes but only 15 in the column? Leave it for now. Did maybe 1.5 weeks of the 5 estimated, still have to leave the electrical and water connections
MI 60 Staging Crew		180				30				remove 3 techs*20days
MI 60 Girder Work		60	7							remove 2 techs*20 days
RR 30 Straight Installation		216			270			50% more	1.5	no change, riggers in February!
EL Installation		105			135			50% more	1.5	no change, riggers in February!
Multiwire/DCCT/Toroid fabrication		30	0.5			3		using Sep-Nov and extrapolate		using Nov-Jan, multiply by 0.5 as things are supposed to be done! and extrapolating Feb-April (probably still an overestimate)
DCCT Installation		38								no change, even though we did a little work
MI 614 Reconstruction		8								magnet in place, still have to finish hookups
RR40 Vacuum		33	2							missed this last month! Check with Chris on work done with loads and fluorinert
RR RF Installation		168	3		90			50% more	1.5	no change, prep work started 1st week of February
Damper Installation		60	2							no change
BPM Hardware Installation		81				9		double	1.5	did the first house first week of February - 3 techs, 3 days + 1 eng day/house. Was 11 tech + 1 eng day/house and doubled, so now use 11+1 and factor of 1.5!
Vacuum Hardware & Prep		110	204					double	2	Linda estimates 50 days tech time left, welding still the same. Not much reduction in the machinist time...maybe 5 days
RR RF cavity 1 Retrofit		30	0			20				finished cavity 1 work, got cavity 2 in cave, still have installation setup/checkout
RR RF mid & hi level		90				5				upstairs work: 11 days charged, so take off 10
RR RF low level						35				charged 30 days so far, take off 20
RR Water		28	2			10				no change
NuMI Water		40				15				no change, most work starting in February
Recycler Shims		80								no change, will be taking place in February
Cable Pulls				100						no change to previous work, some added (10 days for the fiber optic pull and MI8 acnet pull)
RKB Fabrication		0				0				no change
Kicker Power Supplies & Testing		142.5	7.5			112.5		50% more	1.5	Chris updates: lots of details in an email, note that remaining work still has 1.5 factor applied
Installation Planning		57				82.5		50% more dr	1.5	charged 25 days of drafting, 18 days of engineering. Linda estimates 38 days of drafting (22) and 55 (15) of engineering left. Still going to leave the 1.5 piece there
Target & Horn 1 Installation		100				24		guess hadron monitor at s		no change
Target Hall Infrastructure		75				1		double this	2	charged 2.5 days engineering, 0.5 day machinist, 5 days of technician. Subtract tech and 2 days of engineer
Timing & Controls		25				15		double this	2	performed about 1/2 of the remaining work (from end of December), so take 1/2
RBEX and Ramped Supplies		80				30				was 2 techs and 1 engineer full time for 10 weeks, chop 4 weeks off that (charged 5 weeks EE and tech in last 5)
Ramped Correctors		37.5						extrapolate D Kihlken from		take 3/4 of previous estimate
Dollars?		\$1,451,321	\$263,617	\$97,970	\$605,466	\$464,503	\$2,882,876			
value of a single day		\$740	\$1,085	\$980	\$1,223	\$1,185				



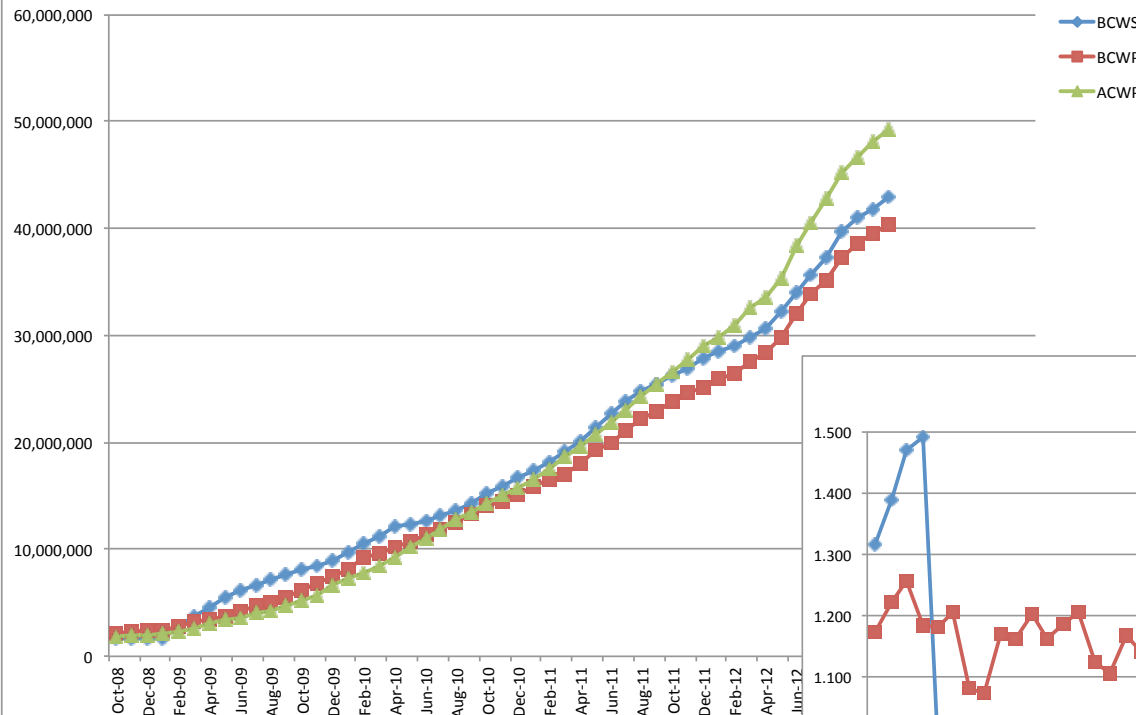
Notes on Progress

- Money tied up in Performance Measurement Techniques?
 - Type E: 50-50 (50% BCWP when start, 50% BCWP when finish)
 - Type F: 0-100 (100% BCWP when finish)
 - ~\$230k of progress reported but not in BCWP
 - Continue through April
 - \$1.26M in unstarted tasks of type E,F
 - \$900k in unstarted tasks of type C

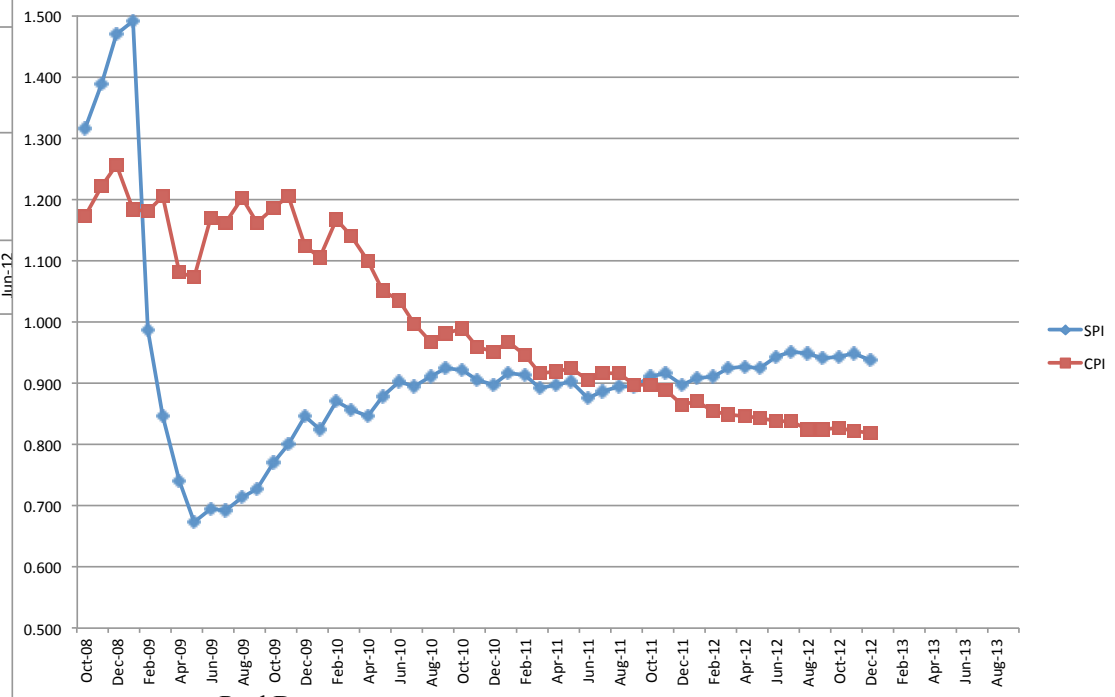


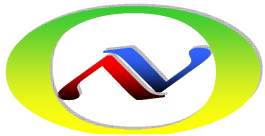
EVMS Performance

Cumulative Performance



Performance Indices (Cumulative)





EVMS Performance

Month	BCWS	BCWP	ACWP	SPI	SV (\$)	CPI	CV (\$)
Oct-11	\$452,944	\$616,798	\$716,328	1.36	347,719	0.86	(118,116)
Nov-11	\$732,319	\$834,344	\$1,178,574	1.14	102,025	0.71	(344,231)
Dec-11	\$1,017,305	\$369,795	\$1,274,208	0.36	(647,510)	0.29	(904,412)
Jan 12	\$581,113	\$860,305	\$805,092	1.48	279,192	1.069	56,587
Feb-12	\$561,330	\$544,809	\$1,180,131	0.97	(16,521)	0.46	(635,322)
Mar-12	\$759,409	\$1,128,324	\$1,541,540	1.49	368,914	0.73	(413,216)
Apr-12	\$845,830	\$820,307	\$1,041,863	0.97	(25,523)	0.79	(221,555)
May-12	\$1,561,287	\$1,372,793	\$1,757,983	0.88	(188,494)	0.78	(385,190)
Jun-12	\$1,785,348	\$2,327,656	\$3,027,918	1.30	542,308	0.77	(700,263)
Jul-12	\$1,624,540	\$1,762,817	\$2,084,021	1.09	138,277	0.85	(321,203)
Aug-12	\$1,534,787	\$1,361,180	\$2,360,712	0.89	(173,607)	0.58	(999,532)
Sep-12	\$2,426,730	\$2,035,864	\$2,341,862	0.84	(390,866)	0.87	(305,998)
FY12	\$14,097,119	\$14,433,033	\$19,725,484	1.02	335,914	0.73	(5,292,451)
Oct-12	\$1,353,600	\$1,320,683	\$1,552,026	0.98	(32,917)	0.85	(231,343)
Nov-12	\$834,116	\$996,748	\$1,412,398	1.195	162,632	0.71	(415,650)
Dec-12	\$1,126,838	\$688,935	\$1,127,111	0.611	(437,903)	0.611	(438,176)
Jan-13			(961,142)				



Shorter term trending?

